

CLAIMS

1. A nematic liquid crystal composition comprising:

at least one compound selected from the group of compounds represented by the general formulas (IA) and (IB), the total content being from 10 to 70% by mass,

at least one compound selected from the group of compounds represented by the general formulas (IIA), (IIB), (IIC) and (IID), the total content being from 10 to 70% by mass,

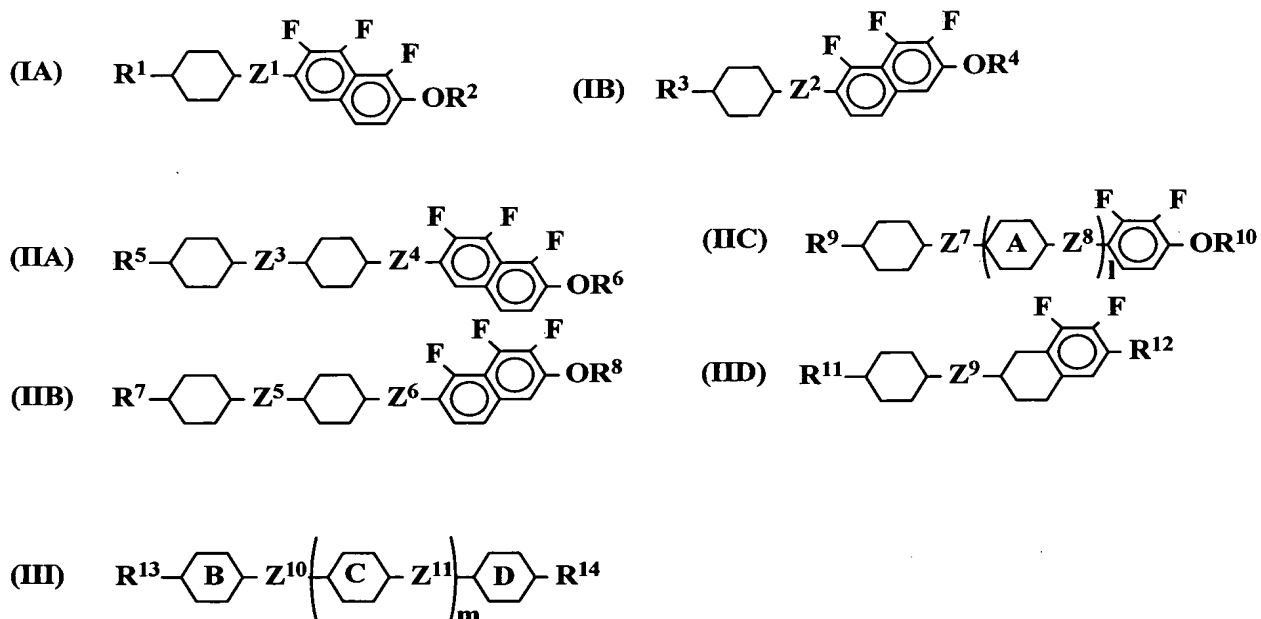
the total content of at least one compound selected from the group of compounds represented by the general formulas (IA), (IB), (IIA), (IIB), (IIC) and (IID) being from 35 to 80% by mass, and

a compound represented by the general formula (III) in the content of 20 to 65% by mass,

wherein a dielectric constant anisotropy is within a range from -12 to -3,

a nematic phase-isotropic liquid phase transition temperature (T_{N-I}) is within a range from 80 to 120°C, and

a viscosity is 45 mPa·s or less:



wherein R^1 to R^{14} each independently represents an alkyl group having 1 to 10 carbon atoms, an alkoxy group having 1 to 10 carbon atoms, an alkenyl group having 2 to 10 carbon atoms, or an alkenyloxy group having 2 to 10 carbon atoms, and one, or two or more CH_2 groups, which are present in said alkyl group, said alkoxy group, said alkenyl group or said alkenyloxy group, may be substituted with $-\text{O}-$, $-\text{CO}-$, or $-\text{COO}-$, while O atoms do not bond with each other directly;

Z^1 to Z^6 and Z^9 to Z^{11} each independently represents a single bond, $-\text{CH}_2\text{CH}_2-$, $-\text{CH}=\text{CH}-$, $-\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2-$, $-\text{CH}_2\text{CH}_2\text{CH}_2\text{O}-$, $-\text{OCH}_2\text{CH}_2\text{CH}_2-$, $-\text{CH}=\text{CHCH}_2\text{CH}_2-$, $-\text{CH}_2\text{CH}_2\text{CH}=\text{CH}-$, $-\text{C}\equiv\text{C}-$, $-\text{CH}_2\text{O}-$, $-\text{OCH}_2-$, $-\text{CF}_2\text{O}-$, $-\text{COO}-$, or $-\text{OCO}-$;

Z^7 and Z^8 each independently represents a single bond, $-\text{CH}_2\text{CH}_2-$, $-\text{CH}=\text{CH}-$, $-\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2-$, $-\text{CH}_2\text{CH}_2\text{CH}_2\text{O}-$, $-\text{OCH}_2\text{CH}_2\text{CH}_2-$, $-\text{CH}=\text{CHCH}_2\text{CH}_2-$, $-\text{CH}_2\text{CH}_2\text{CH}=\text{CH}-$, $-\text{C}\equiv\text{C}-$, $-\text{CH}_2\text{O}-$, or $-\text{OCH}_2-$,

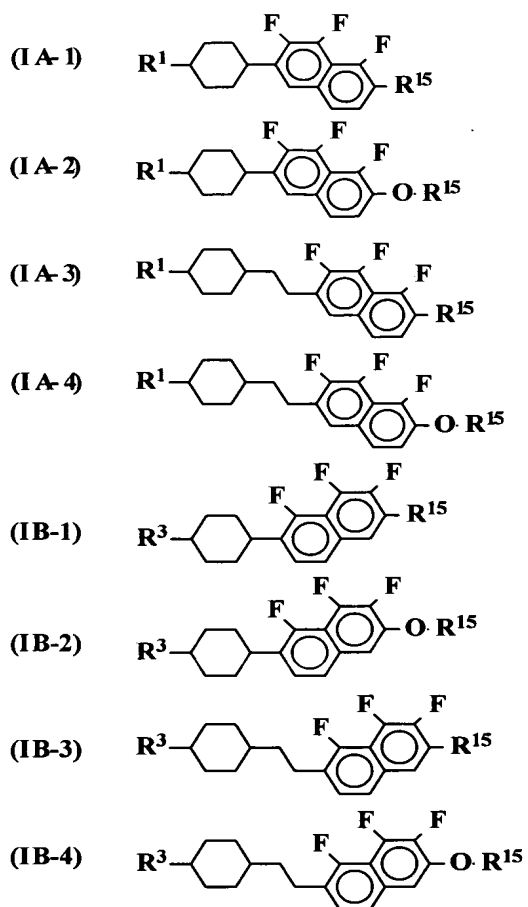
l and m represent 0 or 1;

A represents a trans-1,4-cyclohexylene group or a 1,4-phenylene group; and

B, C and D each independently represents a trans-1,4-cyclohexylene group, a 1,4-phenylene group, or a trans-1,4-cyclohexenylene group.

2. The nematic liquid crystal composition according to claim 1, wherein the compound represented by the general formula (IA) comprises compounds represented by the general formulas (IA-1) to (IA-4), and

the compound represented by the general formula (IB) comprises compounds represented by the general formulas (IB-1) to (IB-4):

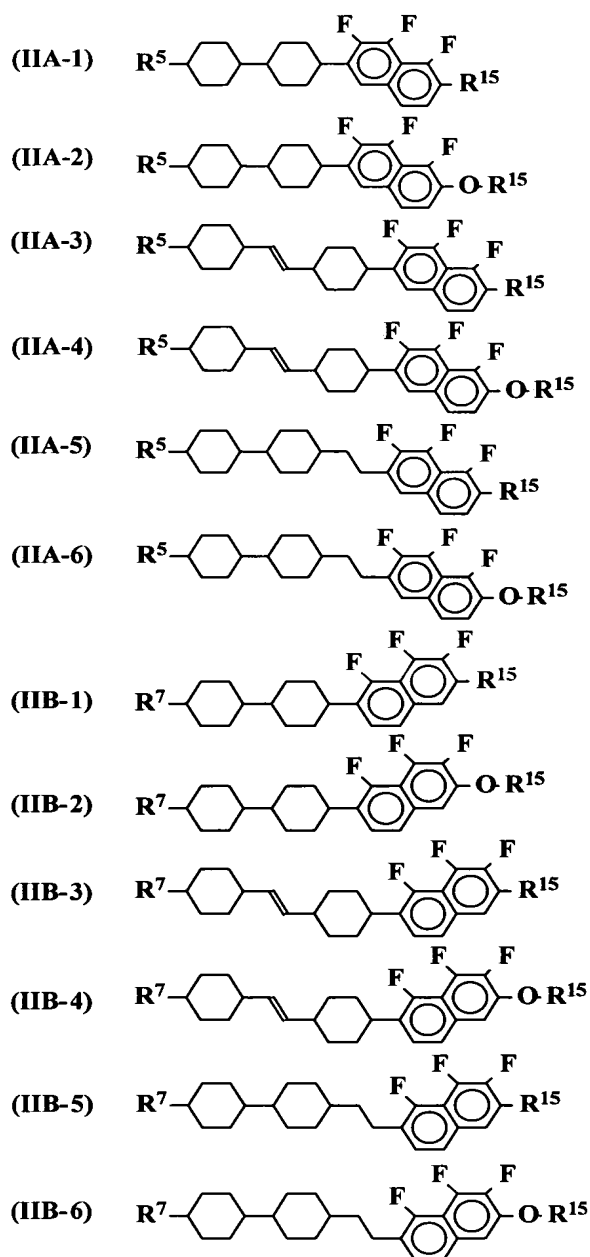


wherein R^1 and R^3 represent an alkyl group having 1 to 10 carbon atoms, an alkoxy group having 1 to 10 carbon atoms, an alkenyl group having 2 to 10 carbon atoms, or an alkenyloxy group having 2 to 10 carbon atoms, and one or more CH_2 groups, which are present in said alkyl group, said alkoxy group, said alkenyl group or said alkenyloxy group, may be substituted with $-\text{O}-$, $-\text{CO}-$, or $-\text{COO}-$, while O atoms do not bond with each other directly, and

R^{15} represents an alkyl group having 1 to 10 carbon atoms or an alkenyl group having 2 to 10 carbon atoms.

3. The nematic liquid crystal composition according to claim 1, wherein the compound represented by the general formula (IIA) comprises compounds represented by the general formulas (IIA-1) to (IIA-6), and

the compound represented by the general formula (IIB) comprises compounds represented by the general formulas (IIB-1) to (IIB-6):

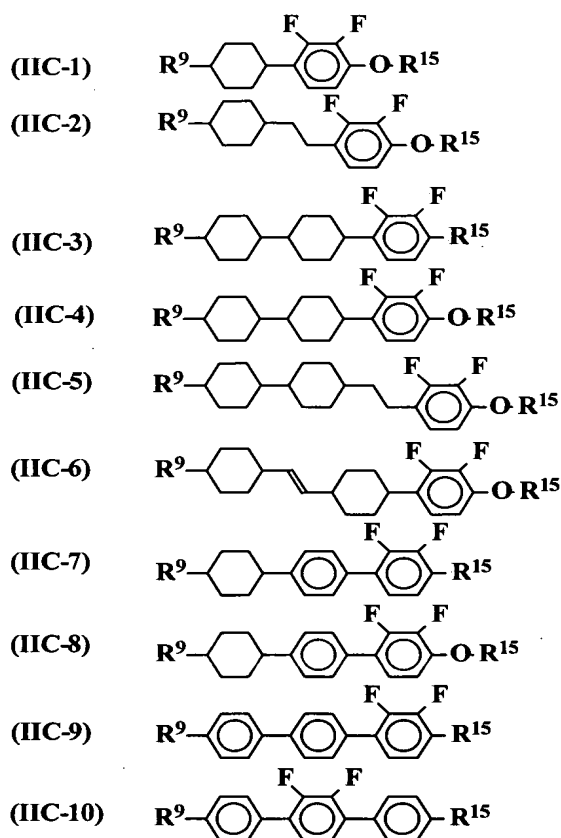


wherein R^5 and R^7 represent an alkyl group having 1 to 10 carbon atoms, an alkoxy group having 1 to 10 carbon atoms, an alkenyl group having 2 to 10 carbon atoms, or an alkenyloxy group having 2 to 10 carbon atoms, one or more CH_2 groups, which are present in said alkyl group, said alkoxy group, said alkenyl group or said alkenyloxy group, may be

substituted with -O-, -CO- or -COO-, while O atoms do not bond with each other directly, each substituent preferably represent an alkyl group having 1 to 5 carbon atoms or an alkenyl group having 2 to 5 carbon atoms, and said alkenyl group is particularly preferably a vinyl group, a 1-propenyl group, or a 3-butenyl group, and

R¹⁵ represents an alkyl group having 1 to 10 carbon atoms or an alkenyl group having 2 to 10 carbon atoms.

4. The nematic liquid crystal composition according to claim 1, wherein the compound represented by the general formula (IIC) comprises compounds represented by the general formulas (IIC-1) to (IIC-10):

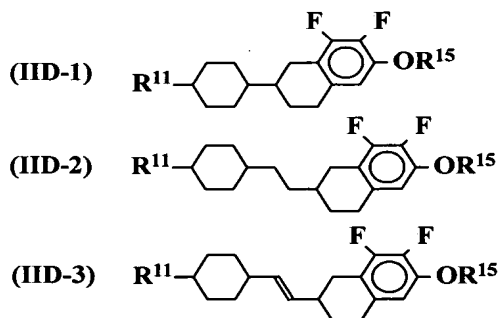


wherein R^9 represents an alkyl group having 1 to 10 carbon atoms, an alkoxy group having 1 to 10 carbon atoms, an alkenyl group having 2 to 10 carbon atoms, or an alkenyloxy group having 2 to 10 carbon atoms, and one or more CH_2 groups, which are present in said alkyl group, said alkoxy group, said alkenyl group or said alkenyloxy group, may be substituted with $-\text{O}-$, $-\text{CO}-$ or $-\text{COO}-$, while O atoms do not bond with each other directly, and

R^{15} represents an alkyl group having 1 to 10 carbon atoms or an alkenyl group having 2 to 10 carbon atoms.

5. The nematic liquid crystal composition according to claim

1, wherein the compound represented by the general formula (IID) comprises compounds represented by the general formulas (IID-1) to (IID-3):

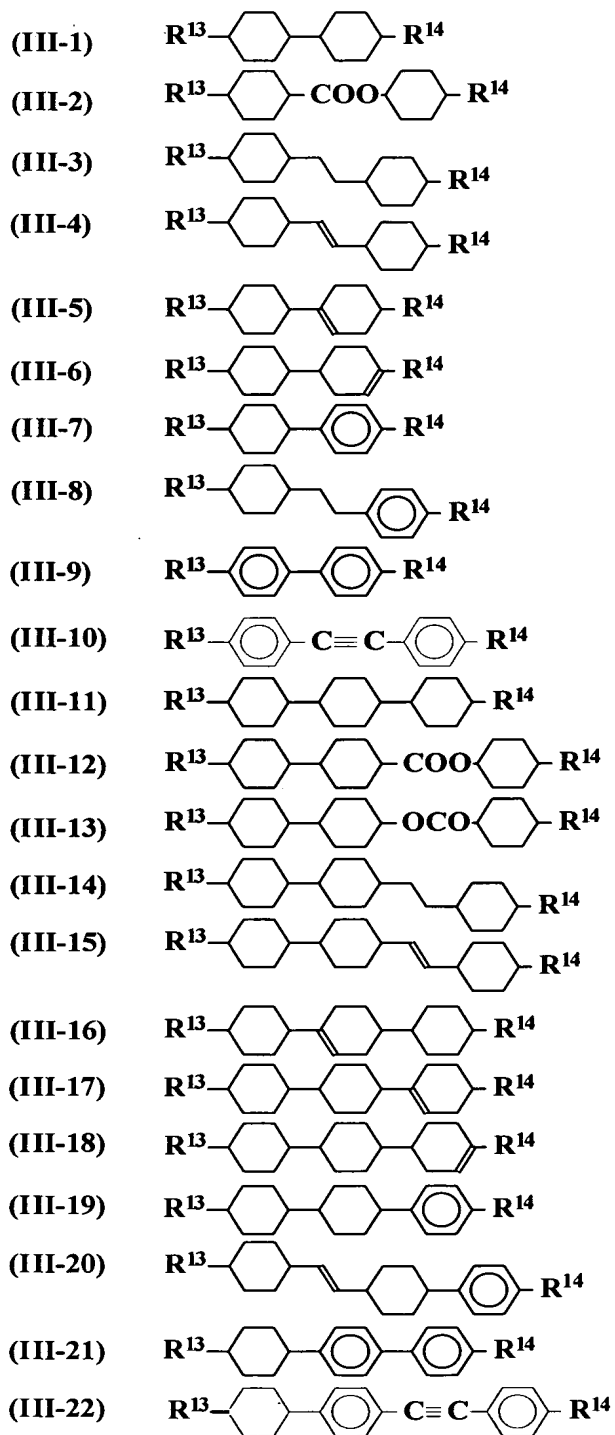


wherein R^{11} represents an alkyl group having 1 to 10 carbon atoms, an alkoxy group having 1 to 10 carbon atoms, an alkenyl group having 2 to 10 carbon atoms, or an alkenyloxy group having 2 to 10 carbon atoms, one or more CH_2 groups, which are present in said alkyl group, said alkoxy group, said alkenyl group or said alkenyloxy group, may be substituted with $-O-$, $-CO-$ or $-COO-$, while O atoms do not bond with each other directly, the substituent preferably represents an alkyl group having 1 to 5 carbon atoms or an alkenyl group having 2 to 5 carbon atoms, and said alkenyl group is particularly preferably a vinyl group, a 1-propenyl group, or a 3-butenyl group, and

R^{15} represents an alkyl group having 1 to 10 carbon atoms or an alkenyl group having 2 to 10 carbon atoms.

6. The nematic liquid crystal composition according to claim

1, wherein the compound represented by the general formula
(III) comprises compounds represented by the general formulas
(III-1) to (III-22):



wherein R^{13} and R^{14} represent an alkyl group having 1 to 10 carbon atoms, an alkoxy group having 1 to 10 carbon atoms, an alkenyl group having 2 to 10 carbon atoms, or an alkenyloxy group having 2 to 10 carbon atoms, one or more CH_2 groups, which are present in said alkyl group, said alkoxy group, said alkenyl group or said alkenyloxy group, may be substituted with -O-, -CO- or -COO-, while O atoms do not bond with each other directly, each substituent independently represents an alkyl group having 1 to 5 carbon atoms or an alkenyl group having 2 to 5 carbon atoms, preferably, and said alkenyl group is particularly preferably a vinyl group, a 1-propenyl group, or a 3-butenyl group.

7. The nematic liquid crystal composition according to any one of claims 2 to 6, wherein the total content of the compounds selected from the group of compounds represented by the general formulas (IA) and (IB) is from 10 to 40% by mass,

the content of the compound represented by the general formula (IIC) is from 10 to 40% by mass,

the total content of the compounds selected from the group of compounds represented by the general formulas (IA), (IB) and (IIC) is from 45 to 70% by mass, and

the content of the compound represented by the general formula (III) is from 30 to 55% by mass.

8. The nematic liquid crystal composition according to any one of claims 2 to 6, wherein the total content of the compounds selected from the group of compounds represented by the general formulas (IA) and (IB) is from 25 to 60% by mass,

the total content of the compounds selected from the group of compounds represented by the general formulas (IA), (IB), (IIA) and (IIB) is from 35 to 65% by mass, and

the content of the compound represented by the general formula (III) is from 35 to 65% by mass.

9. The nematic liquid crystal composition according to any one of claims 2 to 6, wherein the total content of the compounds selected from the group of compounds represented by the general formulas (IA), (IB), (IIA) and (IIB) is from 20 to 60% by mass,

the total content of the compounds selected from the group of compounds represented by the general formulas (IIC) and (IID) is from 30 to 60% by mass, and

the total content of the compounds selected from the group of compounds represented by the general formulas (IA), (IB), (IIA), (IIB), (IIC) and (IID) is from 70 to 80% by mass.

10. The nematic liquid crystal composition according to claim 7, wherein the dielectric constant anisotropy is within a range from -6 to -3,

the nematic phase-isotropic liquid phase transition temperature (T_{N-I}) is within a range from 80 to 120°C,

the refractive index anisotropy is within a range from 0.07 to 0.15, and

the viscosity is 30 mPa·s or less.

11. The nematic liquid crystal composition according to claim 8, wherein the dielectric constant anisotropy is within a range from -6 to -3,

the nematic phase-isotropic liquid phase transition temperature (T_{N-I}) is within a range from 80 to 120°C,

the refractive index anisotropy is within a range from 0.07 to 0.15, and

the viscosity is 30 mPa·s or less.

12. The nematic liquid crystal composition according to claim 9, wherein the dielectric constant anisotropy is within a range from -12 to -6,

the nematic phase-isotropic liquid phase transition temperature (T_{N-I}) is within a range from 80 to 120°C,

the refractive index anisotropy is within a range from 0.07 to 0.15, and

the viscosity is 45 mPa·s or less.

13. A liquid crystal display device for active matrix display,

using the nematic liquid crystal composition according to any one of claims 1 to 12.

14. A liquid crystal display device for VA mode, IPS mode or ECB mode, using the nematic liquid crystal composition according to any one of claims 1 to 12.